In re Appln. of TANIGUCHI et al.
Application No. 09/697,678

REMARKS

In response to the Official Action mailed May 10, 2002 and the Advisory Action mailed September 18, 2002, Applicants submit a Request for Continued Examination and a further claim amendment.

In the attached Amendment, no claims are added or cancelled so that claims 1-12, 14-20, and 26 remain pending. In this Amendment each of the four independent claims is amended. Each of those claims includes a substantial structural limitations. Thus, the ground of rejection relied upon in rejecting many claims, i.e., that the claims are product-by-process claims that do not require consideration of some of their limitations, cannot properly be maintained.

The amendments to claims 1, 2, and 26 are supported throughout the patent application and particularly in the description at pages 10 and 11 of the patent application. The amendment to claim 15 is clearly supported by the description at page 15 of the patent application.

Reconsideration and allowance of all pending claims are appropriate and earnestly solicited.

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
TANIGUCHI et al.

Application No. 09/697,678 Art Unit: 2834

Filed: Octobber 27, 2000 Examiner: M. Budd

For: ELASTIC WAVE GENERATOR

AMENDMENTS TO SPECIFICATION, CLAIMS, AND ABSTRACT MADE IN RESPONSE TO OFFICE ACTION DATED MAY 10, 2002

Amendments to existing claims:

1. (Three Times Amended) An elastic wave generator comprising:

an excitation coil;

a magnetostriction oscillator around which the excitation coil is wound and including laminated magnetostriction sheets having a metallic crystalline structure which exhibits positive strain characteristics in which length varies directionally upon magnetic excitation; and

~~an~~ a continuous metallic oscillator support substantially as ridgid as said magnetostriction oscillator, having ~~a~~ first and second support surfaces in a continuous portion of said oscillator support, said first support surface ~~shrink-fit and~~ directly abutting a first end surface of said magnetostriction oscillator, said first end surface intersecting a direction along which the length of said magnetostriction oscillator changes, and ~~a~~ said second support surface ~~shrink-fit and~~ directly abutting a second end surface of said magnetostriction oscillator, said second end surface intersecting the direction along which the length of said magnetostriction oscillator changes, ~~whereby~~ said first and second support ~~applies~~ surfaces applying a compressive load to said magnetostriction oscillator, through shrink fitting of said magnetostriction between said first and second support surfaces, so that ~~the~~ said magnetostriction oscillator is continuously supported and compressed by said first and second support surfaces when said magnetostriction oscillator changes in ~~the~~ length ~~of said magnetostriction oscillator~~ between first said and second support surfaces due to the ~~magnetic~~

excitation of said excitation coil ~~appearing at said first and second end surfaces are directly supported by said first and second support surfaces~~.

2. (Three Times Amended) An elastic wave generator comprising:

an excitation coil;

a magnetostriction oscillator around which said excitation coil is wound and including laminated of magnetostriction sheets having a metallic crystalline structure which exhibits positive strain characteristics in which length varies directionally upon magnetic excitation;

a magnetic bias device having a magnetic path in common with said magnetostriction oscillator; and

~~an~~ a continuous metallic oscillator support substantially as ridgid as said magnetostriction oscillator, having ~~a~~ first and second support surfaces in a continuous portion of said oscillator support, said first support surface ~~shrink-fit and~~ directly abutting a first end surface of said magnetostriction oscillator, said first end surface intersecting a direction along which the length of said magnetostriction oscillator changes, and ~~a~~ said second support surface ~~shrink-fit and~~ directly abutting a second end surface of said magnetostriction oscillator, said second end surface intersecting the direction along which the length of said magnetostriction oscillator changes, ~~whereby~~ said first and second support ~~applies~~ surfaces applying a compressive load to said magnetostriction oscillator, through shrink fitting of said magnetostriction between said first and second support surfaces, so that ~~the~~ said magnetostriction oscillator is continuously supported and compressed by said first and second support surfaces when said magnetostriction oscillator changes in ~~the~~ length ~~of said magnetostriction oscillator~~ between first said and second support surfaces due to the ~~magnetic~~ excitation of said excitation coil ~~appearing at said first and second end surfaces are directly supported by said first and second support surfaces~~.

3. (Four Times Amended) The elastic wave generator as claimed in claim 1, wherein substantially all magnetostriction energy generated in said magnetostriction oscillator upon excitation of said excitation coil becomes an internal stress at shrink-fit interfaces ~~between~~ of said first and second end surfaces of said magnetostriction oscillator and said first and second support surfaces of said oscillator support.

4. (Three Times Amended) The elastic wave generator as claimed in claim 1, wherein an internal stress at a first shrink-fit interface ~~between~~ of said first end surface of said magnetostriction oscillator and said first support surface of said oscillator support and an internal stress at a second shrink-fit interface ~~between~~ of said second end surface of said magnetostriction oscillator and said second support surface of said oscillator support are initially set compression stresses required for said magnetostriction oscillator.

5. (Three Times Amended) The elastic wave generator as claimed in claim 2, wherein an internal stress at a first shrink-fit interface ~~between~~ of said first end surface of said magnetostriction oscillator and said first support surface of said oscillator support and an internal stress at a second shrink-fit interface ~~between~~ of said second end surface of said magnetostriction oscillator and said second support surface of said oscillator support are stresses that provide, together with the magnetic bias produced by said magnetic bias device, initially set compression stresses required for said magnetostriction oscillator.

6. (Four Times Amended) The elastic wave generator as claimed in claim 1, wherein a first shrink-fit interface ~~between~~ of said first end surface of said magnetostriction oscillator and said first support surface of said oscillator support and a second shrink-fit interface ~~between~~ of said second end surface of said magnetostriction oscillator and said second support surface of said oscillator support are provided by elevating temperature of said magnetostriction oscillator after said magnetostriction oscillator has been cooled in a cryogenic environment and has been installed between said first and second support surfaces of said oscillator support.

7. (Three Times Amended) The elastic wave generator as claimed in claim 1, wherein a first shrink-fit interface ~~between~~ of said first end surface of said magnetostriction oscillator and said first support surface of said oscillator support and a second shrink-fit interface ~~between~~ of said second end surface of said magnetostriction oscillator and said second support surface of said oscillator support are provided by lowering temperature of said oscillator support after said oscillator support has been heated to an elevated temperature and said magnetostriction oscillator has been installed between said first and second support surfaces of said oscillator support.

11. (Three Times Amended) The elastic wave generator as claimed in claim 1, wherein

said magnetostriction oscillator is made by bonding said magnetostriction sheets to each other to form an integral structure of said laminated magnetostriction sheets;

said oscillator support and said magnetostriction support are materials having substantially equal coefficients of thermal expansion; and

an internal stress at a first shrink-fit interface ~~between~~ of said first end surface of said magnetostriction oscillator and said first support surface of said oscillator support and an internal stress at a second shrink-fit interface ~~between~~ of said second end surface of said magnetostriction oscillator and said second support surface of said oscillator support are initially set compression stresses required for said magnetostriction oscillator.

12. (Three Times Amended) The elastic wave generator as claimed in claim 2, wherein

said magnetostriction oscillator is made by bonding said magnetostriction sheets to each other with a hardenable material to form an integral structure of said laminated magnetostriction sheets;

said oscillator support and said magnetostriction support are materials having substantially equal coefficients of thermal expansion; and

an internal stress at a first shrink-fit interface ~~between~~ of said first end surface of said magnetostriction oscillator and said first support surface of said oscillator support and an internal stress at a second shrink-fit interface ~~between~~ of said second end surface of said magnetostriction oscillator and said second support surface of said oscillator support are stresses that provide, together with the magnetic bias produced by said magnetic bias device, initially set compression stresses required for said magnetostriction oscillator.

15. (Three Times Amended) A mounted magnetostriction oscillator comprising:

an object to which an elastic wave is to be imparted; and

a magnetostriction oscillator mounted to the object, wherein

said magnetostriction oscillator comprises an excitation coil wound around a stack of sheets of a metallic magnetostriction material bonded together with an electrically insulating bonding agent for generating an elastic wave in a direction parallel to said sheets ~~with~~ in response to an excitation current flowing through said excitation coil,

said magnetostriction oscillator ~~having~~ has two parallel surfaces intersecting at right angles with an elastic wave radiation direction and spaced apart from each other by a distance A at room temperature and a distance A1 at a temperature lower than room temperature,

the object ~~having~~ has a hole or a recess having two parallel wall surfaces intersecting at right angles with the elastic wave radiation direction and spaced apart from each other by a distance B at room temperature,

~~where~~ A>B>A1 and B is approximately equal to (A- (2/3)(A-A1)), and

said magnetostriction oscillator is in direct contact with said wall surfaces and held in the hole or recess by ~~having been shrink-fit~~ compression forces generated by shrink-fitting said magnetostriction oscillator against said wall surfaces by cooling the magnetostriction oscillator to below room temperature, inserting said magnetostriction oscillator in the hole or recess, and then returning said magnetostriction oscillator to room temperature, ~~whereby said support applies load to said magnetostriction oscillator so that the~~ said magnetostriction oscillator being continuously supported and compressed by said first and second support surfaces when said magnetostriction oscillator changes in ~~the~~ length ~~of said magnetostriction oscillator~~ between first said and second support surfaces due to the ~~magnetic~~ excitation of said excitation coil ~~appearing at said first and second end surfaces are directly supported by said first and second support surfaces~~.

26. (Amended) An elastic wave generator comprising:

an excitation coil;

a magnetostriction oscillator around which the excitation coil is wound and including laminated magnetostriction sheets having a metallic crystalline structure which exhibits positive strain characteristics in which length varies directionally upon magnetic excitation;

a spacer made of a non-magnetic material and located on a first end surface of said magnetostriction oscillator; and

~~an~~ a continuous oscillator support substantially as rigid as said magnetostriction oscillator, having ~~a~~ first and second support surfaces in a continuous portion of said oscillator support, said first support surface ~~shrink-fit and~~ directly abutting said spacer, said first support surface intersecting a direction along which the length of said magnetostriction oscillator changes, and a second support surface ~~shrink-fit and~~ directly abutting a second end surface of said magnetostriction oscillator, said second support surface intersecting the direction along which the length of said magnetostriction oscillator changes, ~~whereby~~ said first and second support ~~applies~~ surfaces applying a compressive load to said

magnetostriction oscillator, through shrink fitting of said magnetostriction between said first and second support surfaces, so that ~~the~~ said magnetostriction oscillator is continuously supported and compressed by said first and second support surfaces when said magnetostriction oscillator changes in ~~the~~ length ~~of said magnetostriction oscillator~~ between first said and second support surfaces due to the ~~magnetic~~ excitation of said excitation coil ~~appearing at said first and second end surfaces are directly supported by said first and second support surfaces~~.